

Claims

1. An optical coupler comprising an input waveguide, an intermediate waveguide, an output waveguide, a first grating situated between the input and intermediate waveguides, and a second grating situated between the intermediate and output waveguides such that, in use, light propagating in the input waveguide is coupled into the intermediate waveguide with the assistance of the first grating, and thence is coupled into the output waveguide with the assistance of the second grating.
2. A coupler according to claim 1, comprising only two said gratings.
3. A coupler according to claim 1 or claim 2, which is a directional coupler.
4. A coupler according to any preceding claim, in which the input and output waveguides have differing refractive indices.
5. A coupler according to any preceding claim, in which the input and output waveguides have at least one differing transverse dimension.
6. A coupler according to any preceding claim, in which the intermediate waveguide has a different refractive index to that of the input waveguide and/or the output waveguide.
7. A coupler according to claim 6, in which the intermediate waveguide has a higher refractive index than that of input waveguide and a lower refractive index than that of the output waveguide.
8. A coupler according to any preceding claim, in which the intermediate waveguide has at least one different transverse dimension to that of the input waveguide and/or the output waveguide.

9. A coupler according to any preceding claim, further comprising a first transitional layer situated between the input waveguide and the intermediate waveguide.
10. A coupler according to any preceding claim, further comprising a second transitional layer situated between the output waveguide and the intermediate waveguide.
11. A coupler according to any preceding claim, in which the first and second gratings have differing periods and/or lengths and/or depths and/or profiles and/or duty cycles.
12. A coupler according to any preceding claim, comprising a layered structure, in which each waveguide, grating or transitional layer comprises a respective layer or part thereof, of the structure.
13. A coupler according to claim 12, in which the layered structure comprises layers of semiconductor and/or dielectric material.
14. A coupler according to claim 13, in which the semiconductor material comprises one or more of: silicon or related compounds; gallium arsenide or related compounds; indium phosphide or related compounds; lithium niobate or related compounds.
15. A coupler according to any one of claims 12 to 14, in which the dielectric material comprises a glass, preferably a phosphosilicate glass.
16. A coupler according to any preceding claim, in which the waveguides comprise rib waveguides and/or planar waveguides and/or strip waveguides and/or embedded waveguides;
17. An integrated optical device comprising an optical coupler according to any preceding claim, in which the input waveguide and/or the

output waveguide of the coupler comprises a semiconductor waveguide of the device.

18. A device according to claim 17, in which the semiconductor waveguide of the device comprises a semiconductor laser of the device.
19. A device according to claim 17, in which the semiconductor waveguide of the device comprises a photodiode of the device.
20. The use of an optical coupler or device according to any preceding claim, to couple light between an external first waveguide and the output waveguide of the coupler, via the input waveguide of the coupler.
21. The use according to claim 20, in which the external first waveguide comprises an optical fibre.